FIG.1

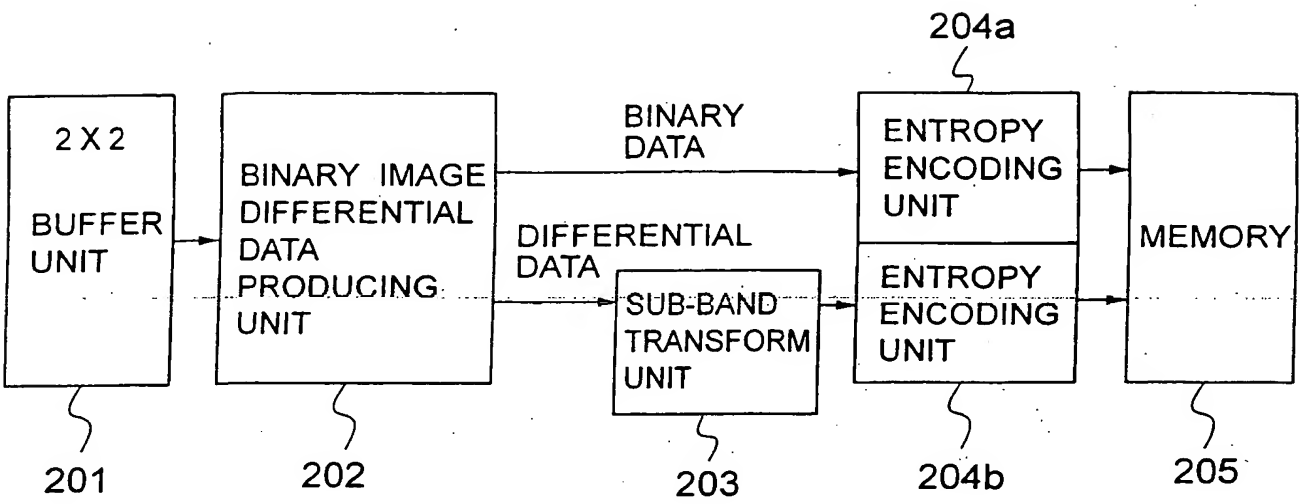

204a
2 X 2
BUFFER UNIT
BINARY IMAGE DIFFERENTIAL DATA PRODUCING UNIT
BINARY DATA
DIFFERENTIAL DATA
SUB-BAND TRANSFORM UNIT
ENTROPY ENCODING UNIT
ENTROPY ENCODING UNIT
MEMORY
201
202
203
204b
205

FIG.2

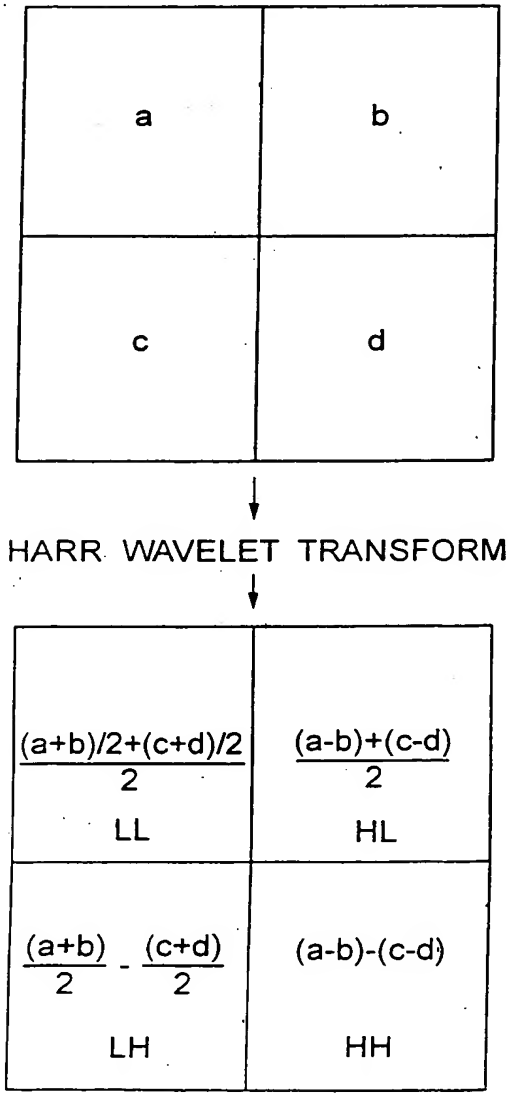

a
b
c
d
HARR WAVELET TRANSFORM
(a+b)/2+(c+d)/2
2
LL
(a-b)+(c-d)
2
HL
(a+b)/2 - (c+d)/2
LH
(a-b)-(c-d)
HH

FIG. 3

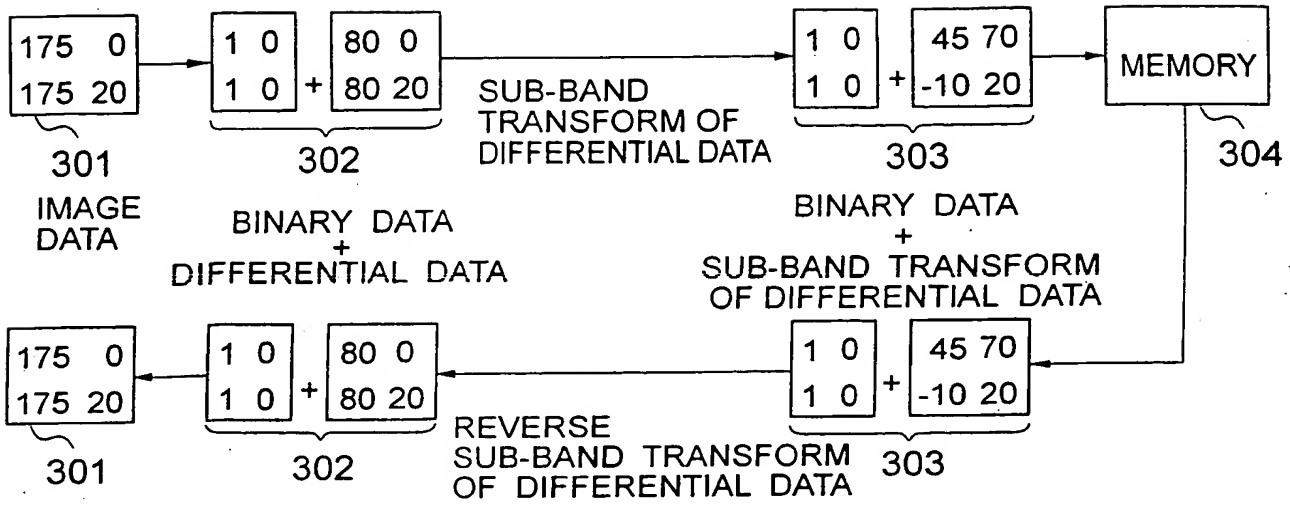


FIG. 4 A

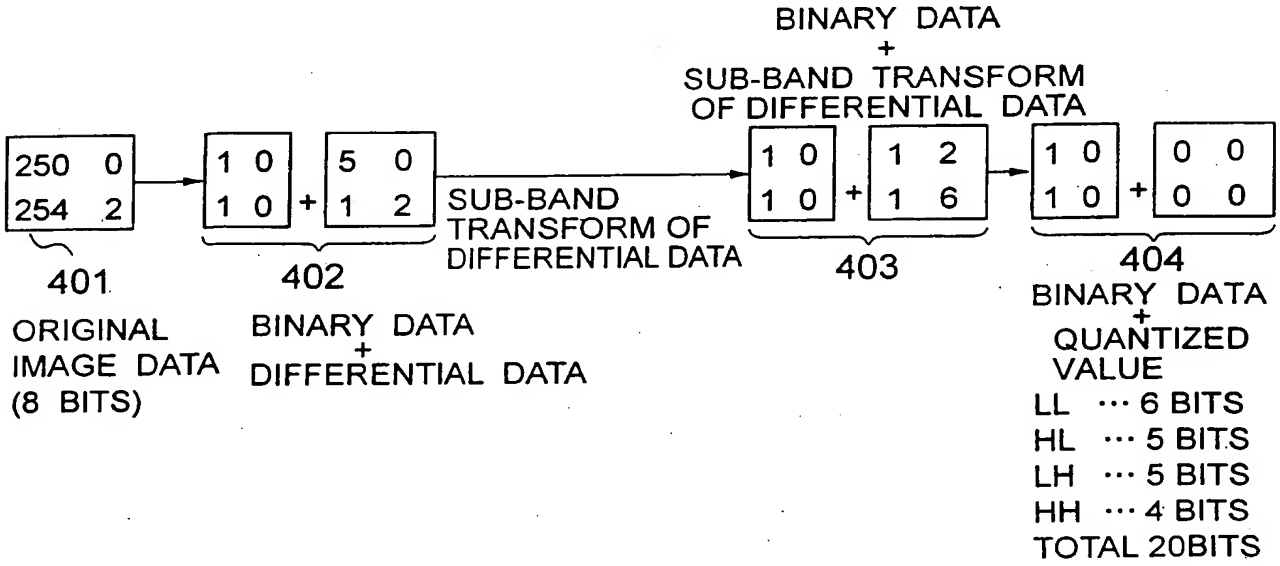


FIG. 4B

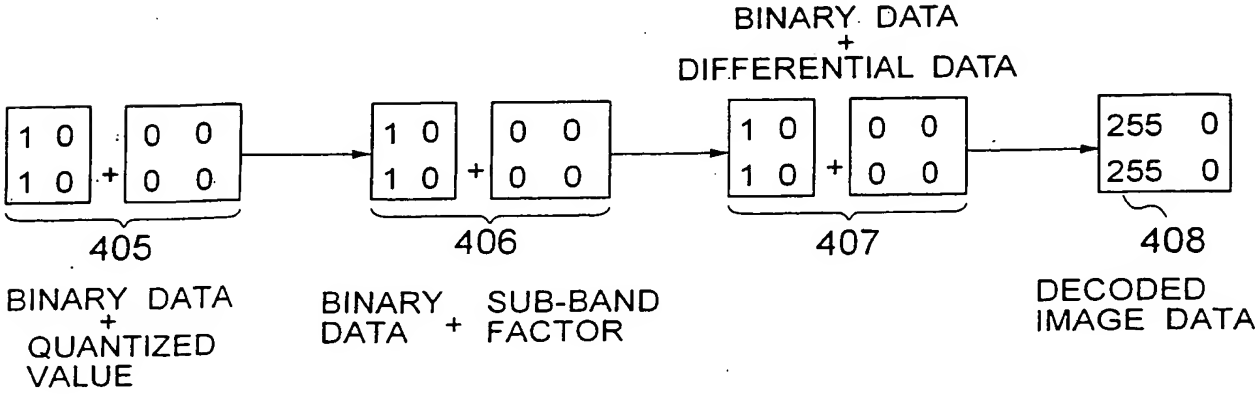


FIG.5

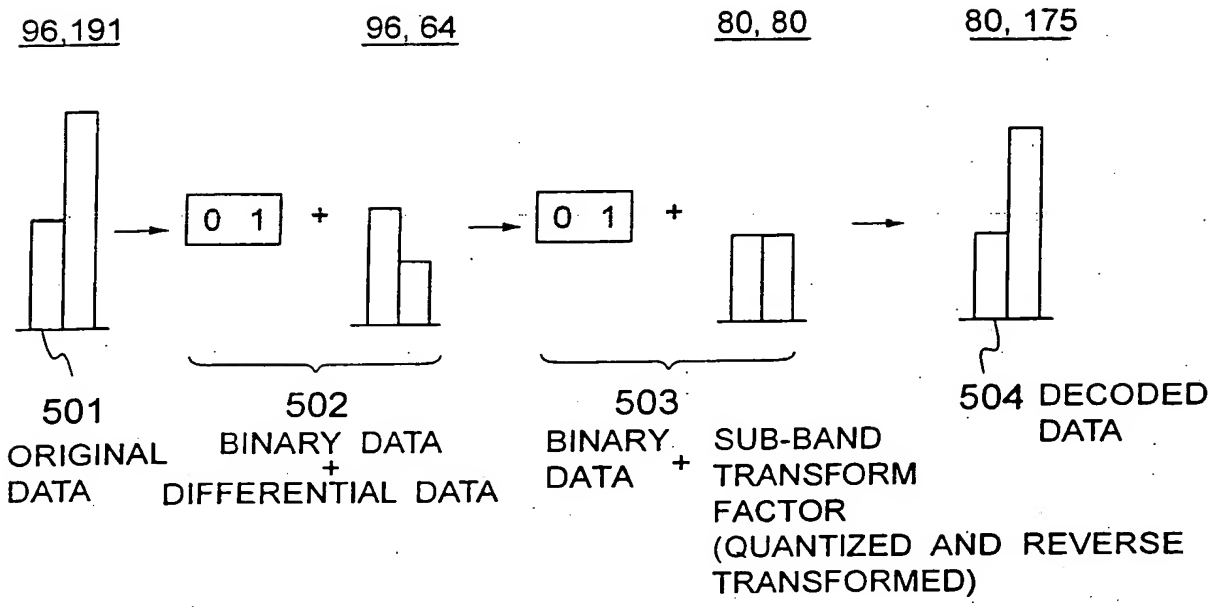

96,191
96, 64
80, 80
80, 175
0 1
+
0 1
+
501
ORIGINAL DATA
502
BINARY DATA
+
DIFFERENTIAL DATA
503
BINARY DATA
+
SUB-BAND TRANSFORM FACTOR
(QUANTIZED AND REVERSE TRANSFORMED)
504 DECODED DATA

FIG.6

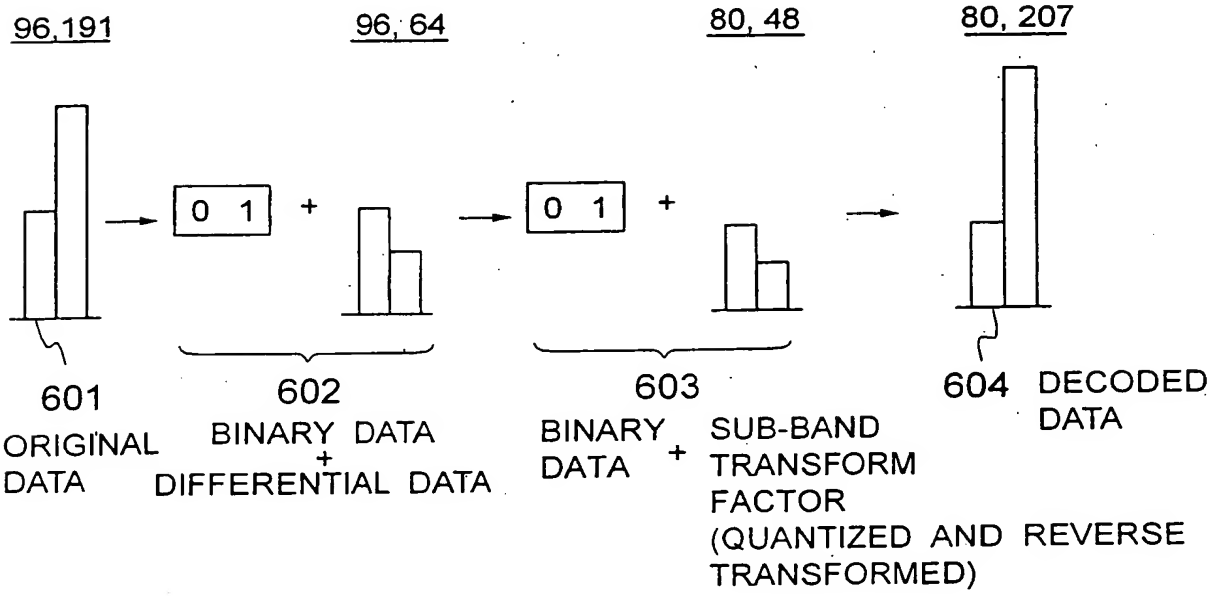

96,191
96, 64
80, 48
80, 207
0 1
+
0 1
+
601
ORIGINAL DATA
602
BINARY DATA
+
DIFFERENTIAL DATA
603
BINARY DATA
+
SUB-BAND TRANSFORM FACTOR
(QUANTIZED AND REVERSE TRANSFORMED)
604 DECODED DATA

FIG.7

HL	LH	HH	CODE
0	0	0	0
32	0	0	1
-32	0	0	2
0	32	0	3
0	-32	0	4
64	0	0	5
-64	0	0	6
0	64	0	7
0	-64	0	8
128	0	0	9
-128	0	0	10
0	128	0	11
0	-128	0	12
32	32	0	13
-32	-32	0	14
			15 (NOT USED)

FIG.8

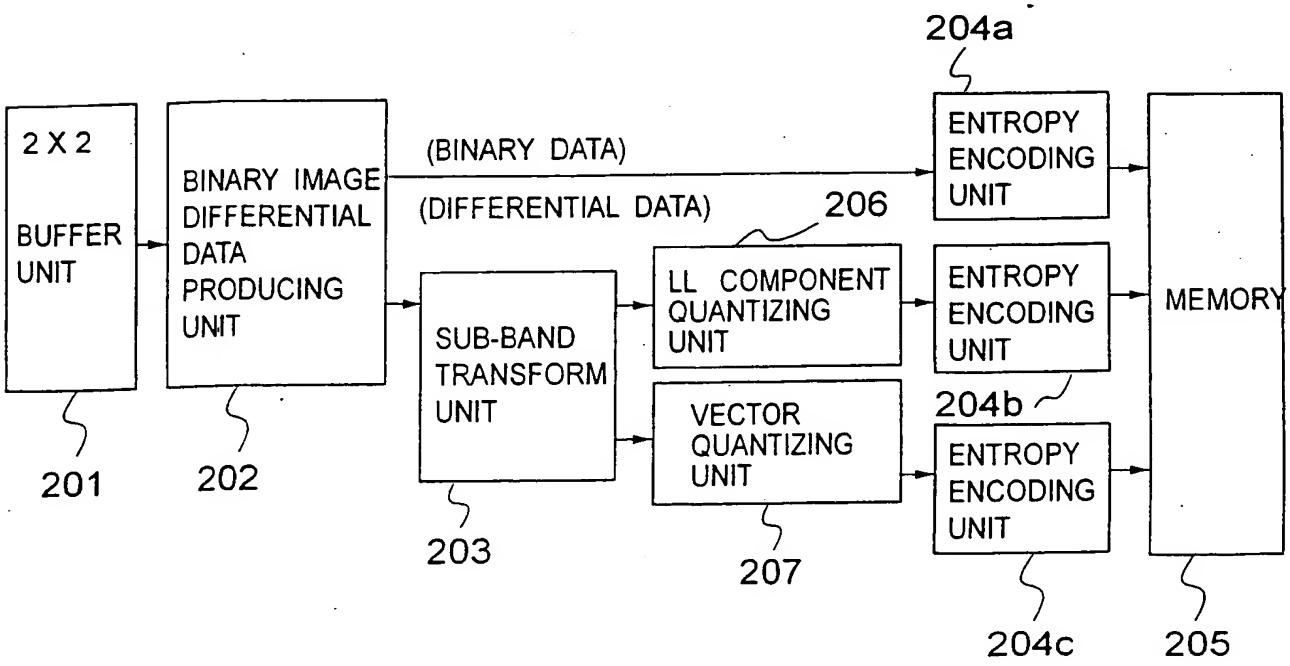


FIG.9

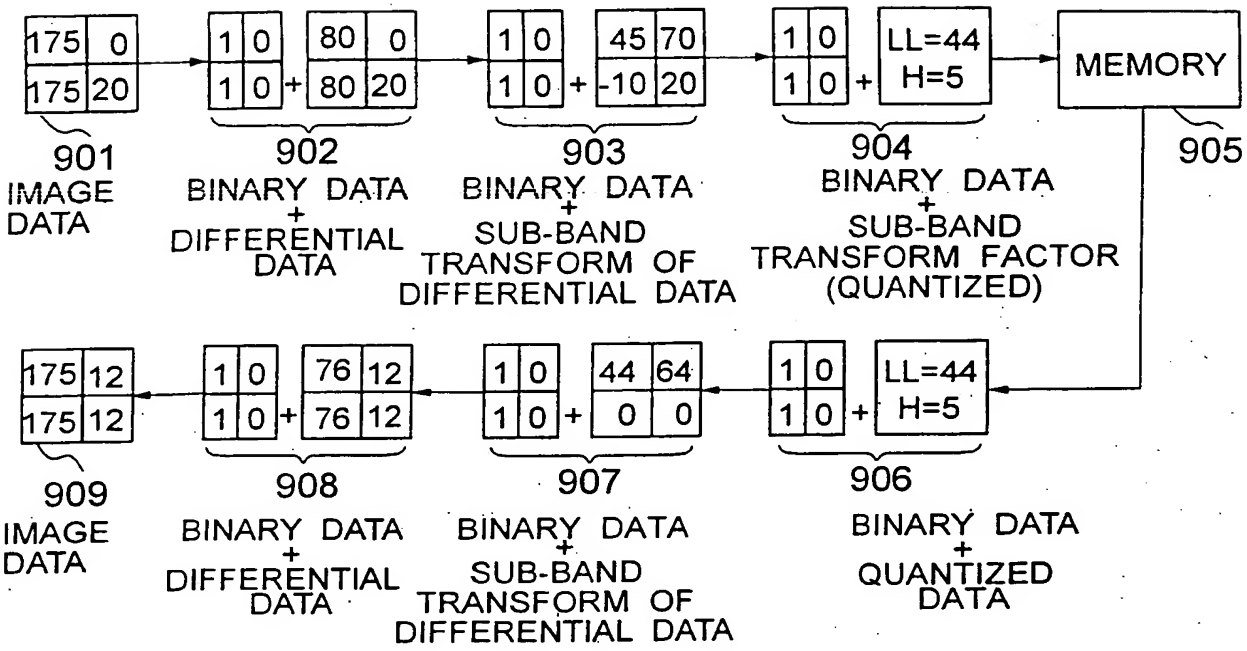

175 0
175 20
901
IMAGE DATA
1 0
1 0
+
80 0
80 20
902
BINARY DATA + DIFFERENTIAL DATA
1 0
1 0
+
45 70
-10 20
903
BINARY DATA + SUB-BAND TRANSFORM OF DIFFERENTIAL DATA
1 0
1 0
+
LL=44
H=5
904
BINARY DATA + SUB-BAND TRANSFORM FACTOR (QUANTIZED)
MEMORY
905
175 12
175 12
909
IMAGE DATA
1 0
1 0
+
76 12
76 12
908
BINARY DATA + DIFFERENTIAL DATA
1 0
1 0
+
44 64
0 0
907
BINARY DATA + SUB-BAND TRANSFORM OF DIFFERENTIAL DATA
1 0
1 0
+
LL=44
H=5
906
BINARY DATA + QUANTIZED DATA

FIG.10

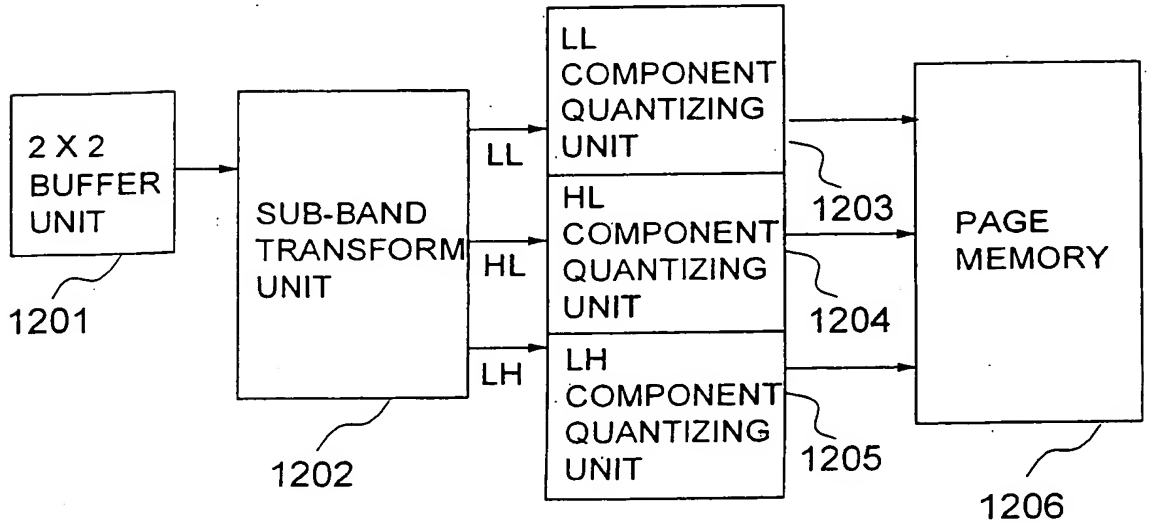

2 X 2 BUFFER UNIT
1201
SUB-BAND TRANSFORM UNIT
1202
LL
HL
LH
LL COMPONENT QUANTIZING UNIT
HL COMPONENT QUANTIZING UNIT
LH COMPONENT QUANTIZING UNIT
1203
1204
1205
PAGE MEMORY
1206

FIG.11

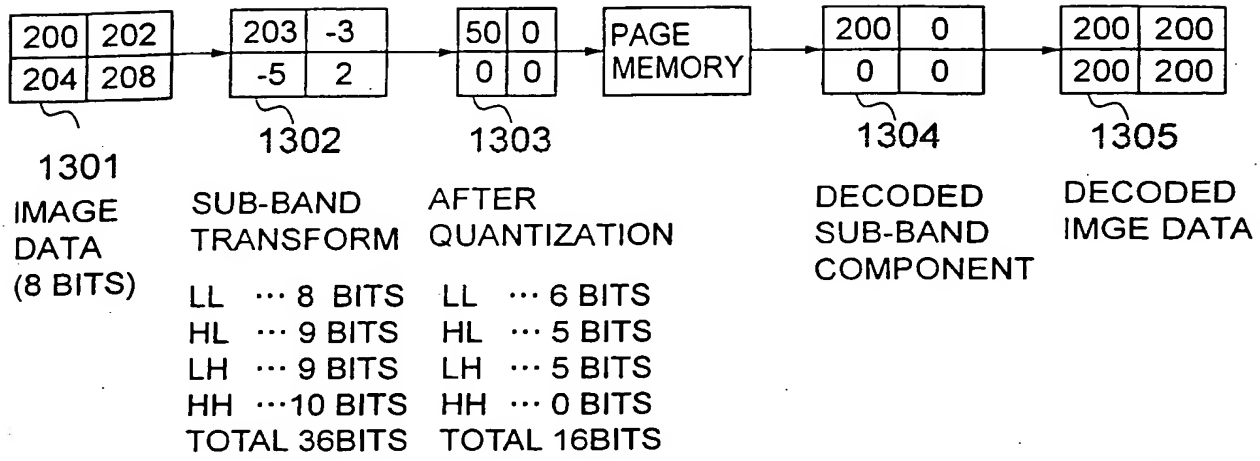

200 202
204 208
1301
IMAGE DATA (8 BITS)
203 -3
-5 2
1302
SUB-BAND TRANSFORM
LL ··· 8 BITS
HL ··· 9 BITS
LH ··· 9 BITS
HH ···10 BITS
TOTAL 36BITS
50 0
0 0
1303
AFTER QUANTIZATION
LL ··· 6 BITS
HL ··· 5 BITS
LH ··· 5 BITS
HH ··· 0 BITS
TOTAL 16BITS
PAGE MEMORY
200 0
0 0
1304
DECODED SUB-BAND COMPONENT
200 200
200 200
1305
DECODED IMGE DATA

FIG.12

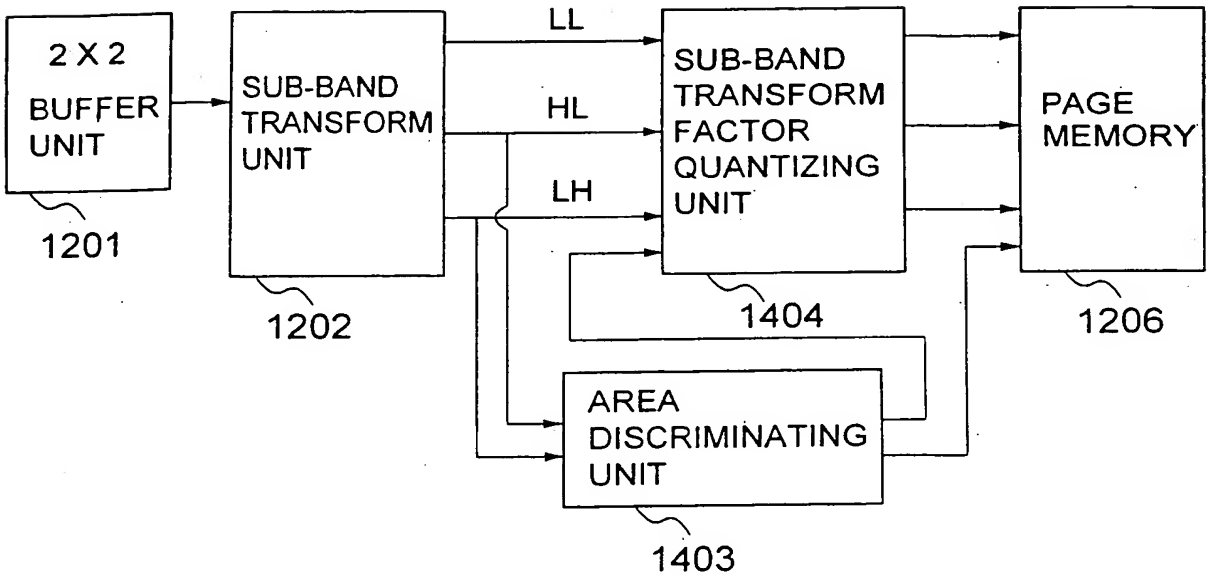

2 X 2 BUFFER UNIT
1201
SUB-BAND TRANSFORM UNIT
1202
LL
HL
LH
SUB-BAND TRANSFORM FACTOR QUANTIZING UNIT
1404
PAGE MEMORY
1206
AREA DISCRIMINATING UNIT
1403

FIG.13

AREA	EDGE	NON-EDGE
DETERMINING METHOD	|HL|≧64 OR |LH|≧64	OTHER THAN EDGE AREA
FLAG(1 BIT)	1	0
QUANTIZING METHOD	LL···DIVIDE BY 4 (6 BITS) HL,LH···DIVIDE BY 64 (3 BITS) HH··· 0 (0 BIT) (TOTAL 13 BITS)	LL···DIVIDE BY 4 (6 BITS) HL,LH···DIVIDE BY 16 (3 BITS) HH··· 0 (0 BIT) (TOTAL 13 BITS)

FIG.14A

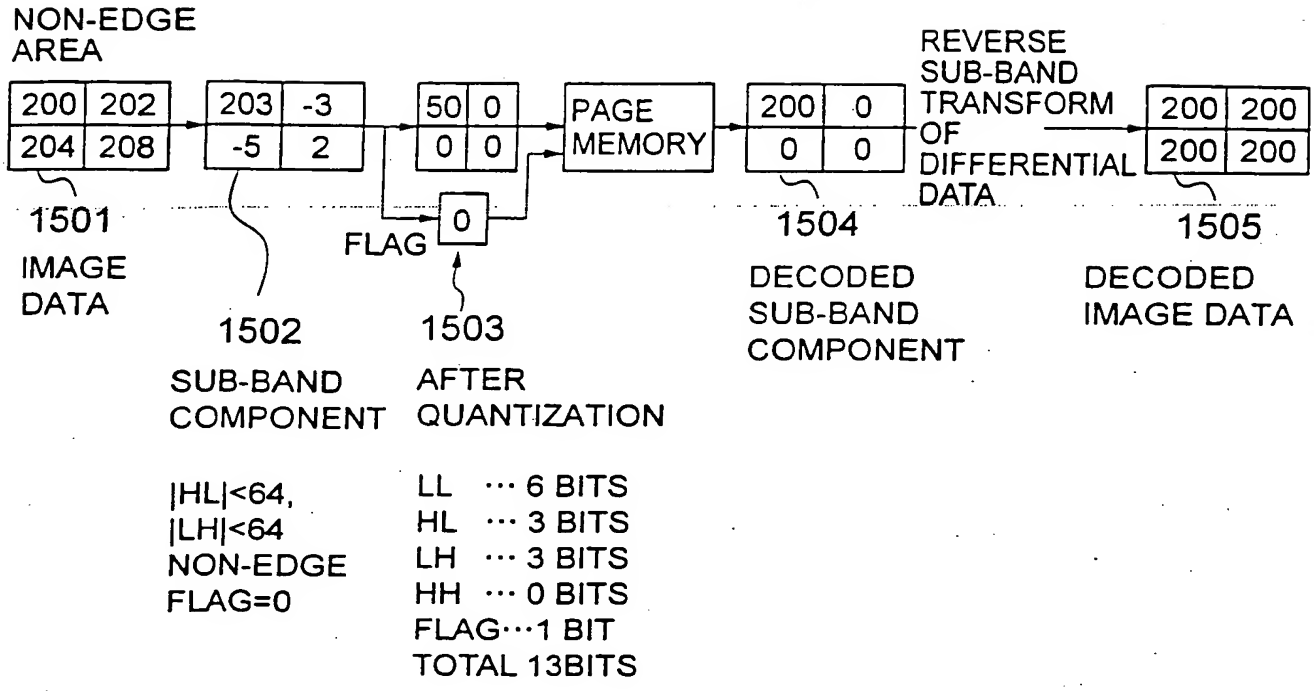


FIG.14B

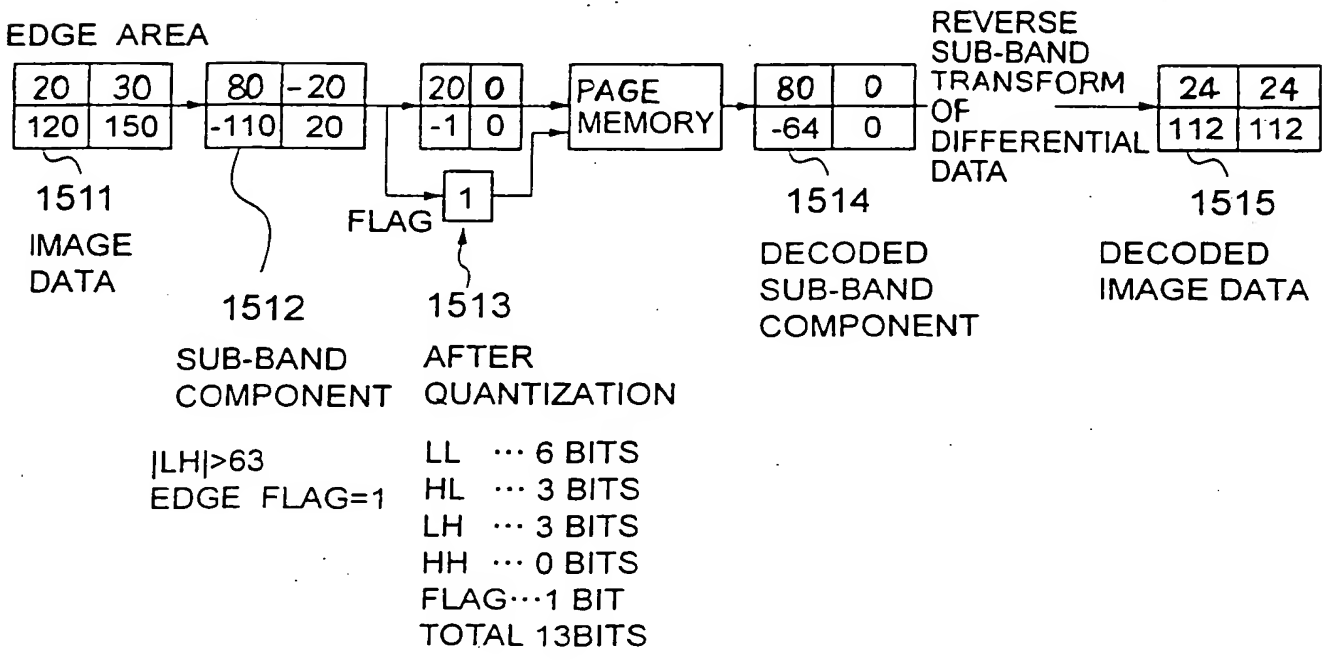


FIG.15

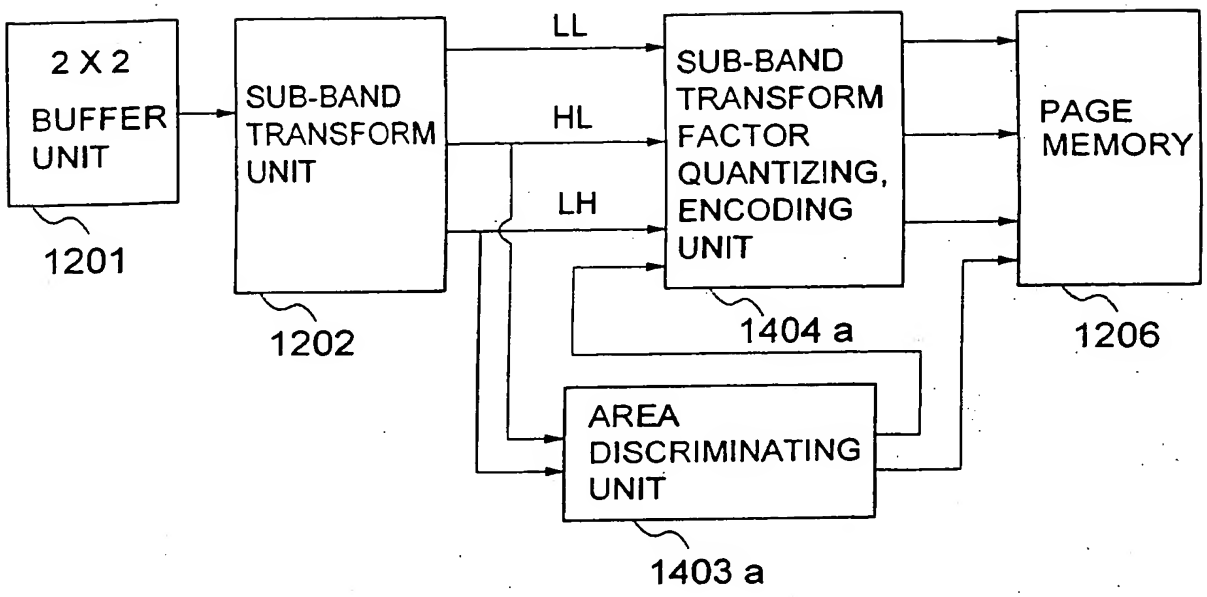


FIG.16

AREA	EDGE	NON-EDGE
DETERMINING METHOD	|HL|≧16 OR |LH|≧16	OTHER THAN EDGE AREA
FLAG(1 BIT)	1	0
QUANTIZING METHOD	LL···DIVIDE BY 16 (4 BITS) HL,LH···DIVIDE BY 32 (4 BITS) HH··· 0 (0 BIT) (TOTAL 13 BITS)	LL···DIVIDE BY 4 (6 BITS) HL,LH···DIVIDE BY 4 (3 BITS) HH··· 0 (0 BIT) (TOTAL 13 BITS)

FIG.17A

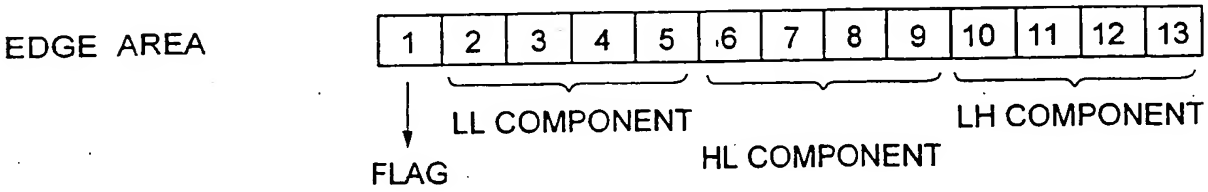


FIG.17B

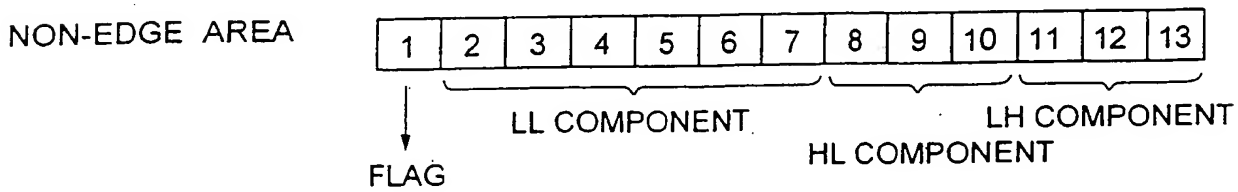
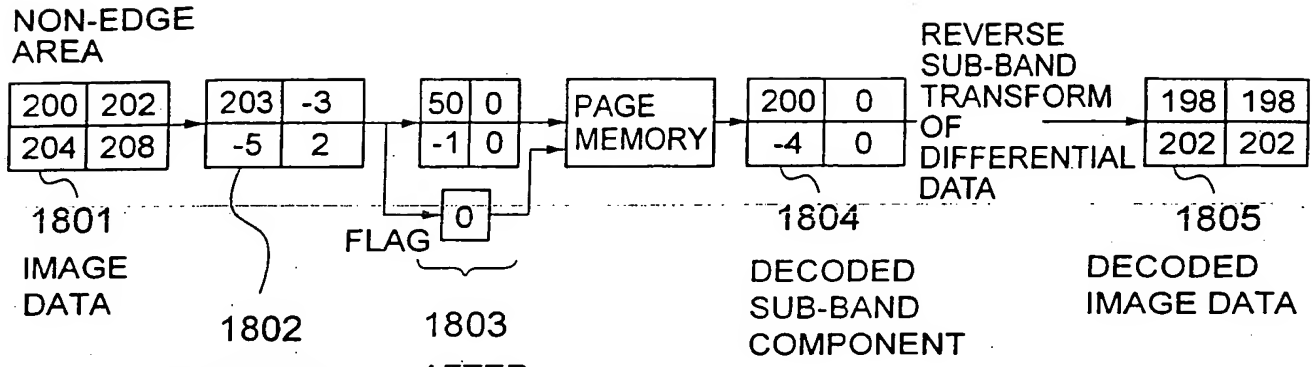


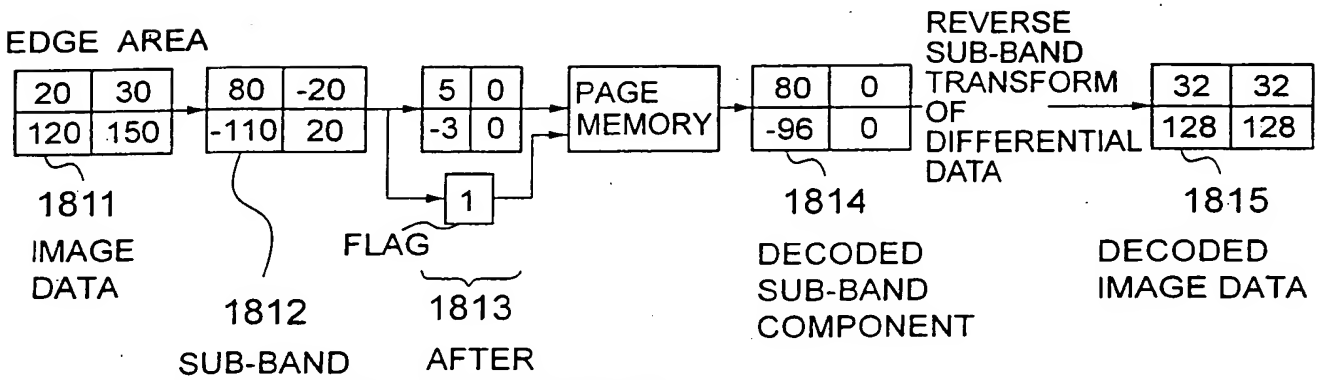
FIG.18A



|HL|<16,
|LH|<16
NON-EDGE
FLAG=0

LL ··· 6 BITS
HL ··· 3 BITS
LH ··· 3 BITS
HH ··· 0 BITS
FLAG···1 BIT
TOTAL 13BITS

FIG.18B



|HL|>15,
|LH|>15
EDGE FLAG=1

LL ··· 4 BITS
HL ··· 4 BITS
LH ··· 4 BITS
HH ··· 0 BITS
FLAG···1 BIT
TOTAL 13BITS

FIG.19

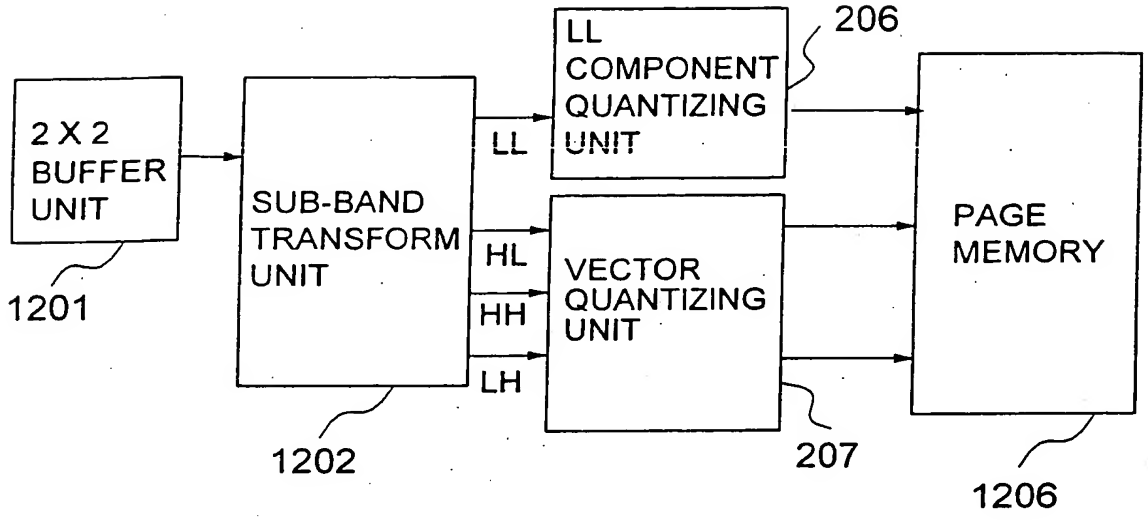

2 X 2
BUFFER
UNIT
1201
SUB-BAND
TRANSFORM
UNIT
1202
LL
HL
HH
LH
LL
COMPONENT
QUANTIZING
UNIT
206
VECTOR
QUANTIZING
UNIT
207
PAGE
MEMORY
1206

FIG.20

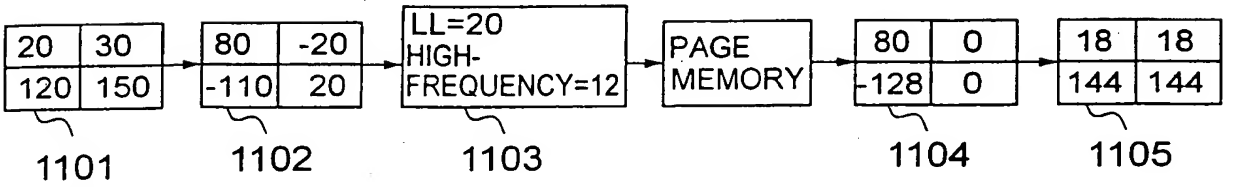

20 30
120 150
1101
IMAGE
DATA
(8 BITS)
80 -20
-110 20
1102
SUB-BAND
TRANSFORM
LL ··· 8 BITS
HL ··· 9 BITS
LH ··· 9 BITS
HH ···10 BITS
TOTAL 36BITS
LL=20
HIGH-
FREQUENCY=12
1103
AFTER
QUANTIZATION
LL ··· 8 BITS
ENTIRE HIGH-
FREQUENCY COMPONENTS
··· 4 BITS
TOTAL10 BITS
PAGE
MEMORY
80 0
-128 0
1104
DECODED
SUB-BAND
COMPONENT
18 18
144 144
1105
DECODED
IMAGE
DATA

FIG:21

AREA	EDGE	NON-EDGE
DETERMINING METHOD	$\|HL\| \geqq 16$ OR $\|LH\| \geqq 16$	OTHER THAN EDGE AREA
FLAG	TWO LSBs ARE NOT "00"	TWO LSBs ARE "00"
QUANTIZING METHOD	①LL···DIVIDE BY 16 (4 BITS) ②HIGH-FREQUENCY COMPONENTS···VECTOR QUANTIZATION BY 4 BITS MULTIPLE OF 4 IS NOT USED (TOTAL 8 BITS)	①LL···DIVIDE BY 4 (6 BITS) ②HIGH-FREQUENCY COMPONENTS···ASSIGNED 2 BITS ONLY " 00" IS USED FOR HL,LH,HH (TOTAL 8 BITS)

FIG.22A

EDGE AREA (|HL|≧16 OR |LH|≧16) :

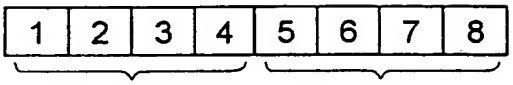


FIG.22B

NON-EDGE AREA(OTHER THAN EDGE AREA) :

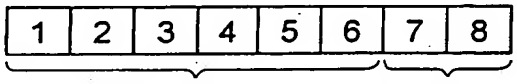


FIG.22C

FLAG :TWO LOWER ORDER BITS ARE "00"... NON-EDGE AREA
OTHER THAN NON-EDGE AREA ... EDGE AREA

FIG.22D

CORRESPONDENCE TABLE OF CODES AND VECTOR CODES (HL,LH,HH) :

HIGH-FREQUENCY COMPONENTS CODE	EDGE (16,4 BITS)	NON-EDGE (4,2 BITS)
0	NOT USED	(0, 0, 0)
1	(16, 0, 0)	NOT USED
2	(-16, 0, 0)	NOT USED
3	(0, 16, 0)	NOT USED
4	NOT USED	
5	(0, -16, 0)	
6	(64, 0, 0)	
7	(-64, 0, 0)	
8	NOT USED	
9	(0, 64, 0)	
10	(0, -64, 0)	
11	(128, 0, 0)	
12	NOT USED	
13	(-128, 0, 0)	
14	(0, 128, 0)	
15	(0, -128, 0)	

FIG.23A

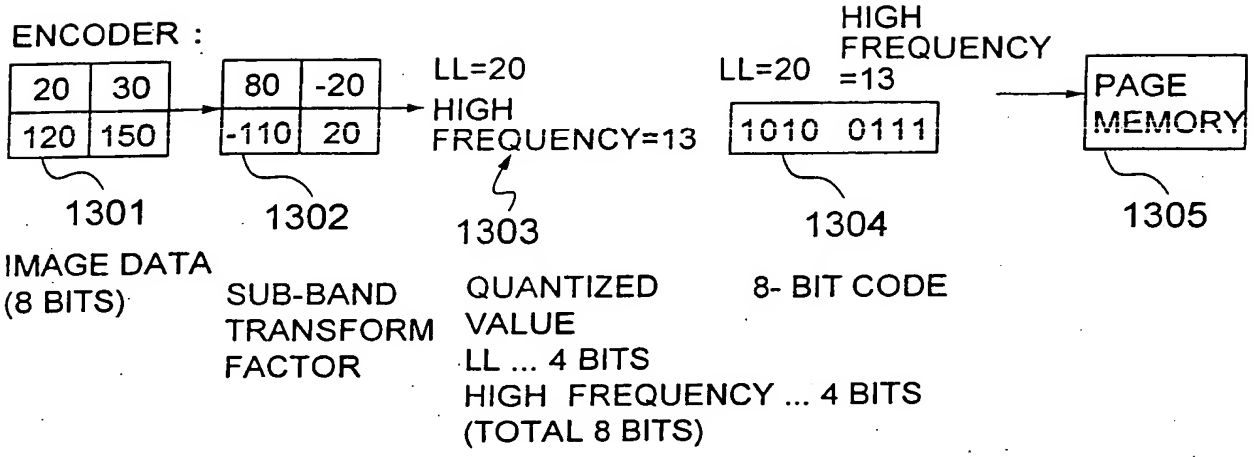


FIG.23B

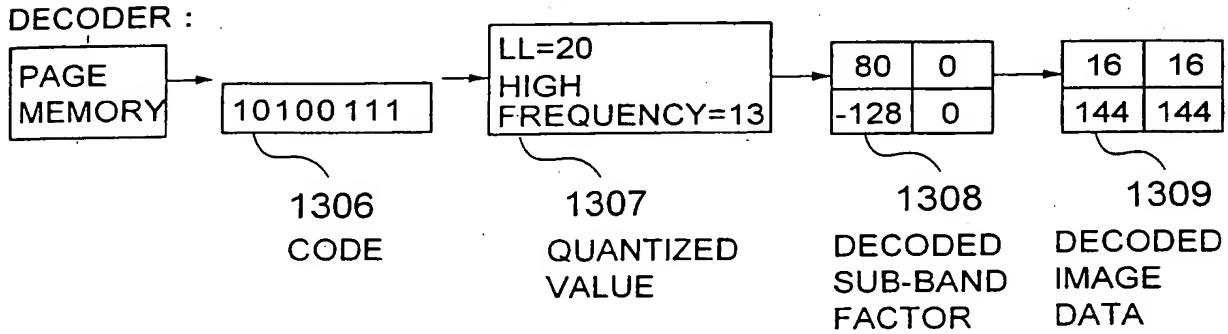


FIG.24A

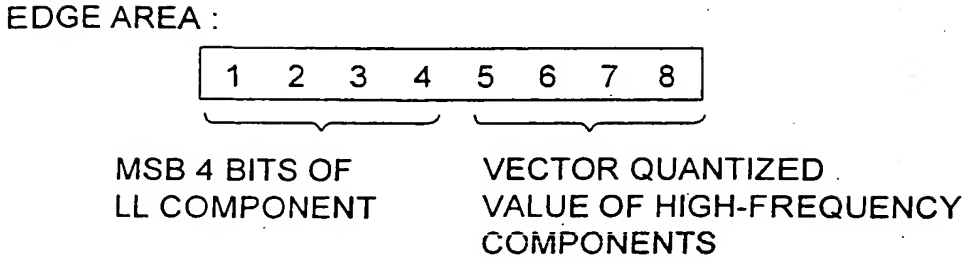


FIG.24B

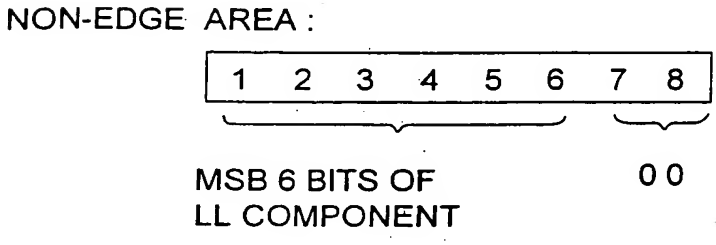


FIG.24C

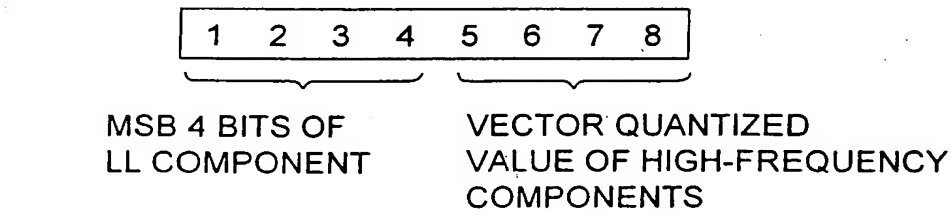


FIG.24D

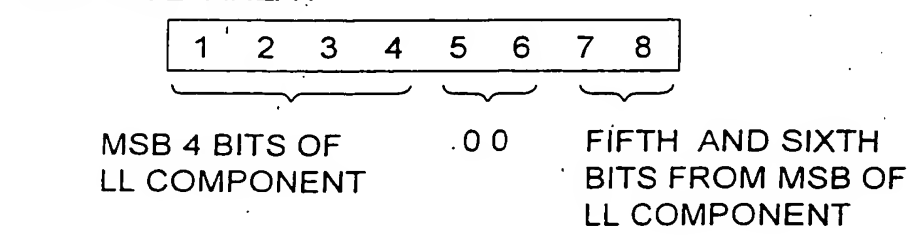


FIG.25

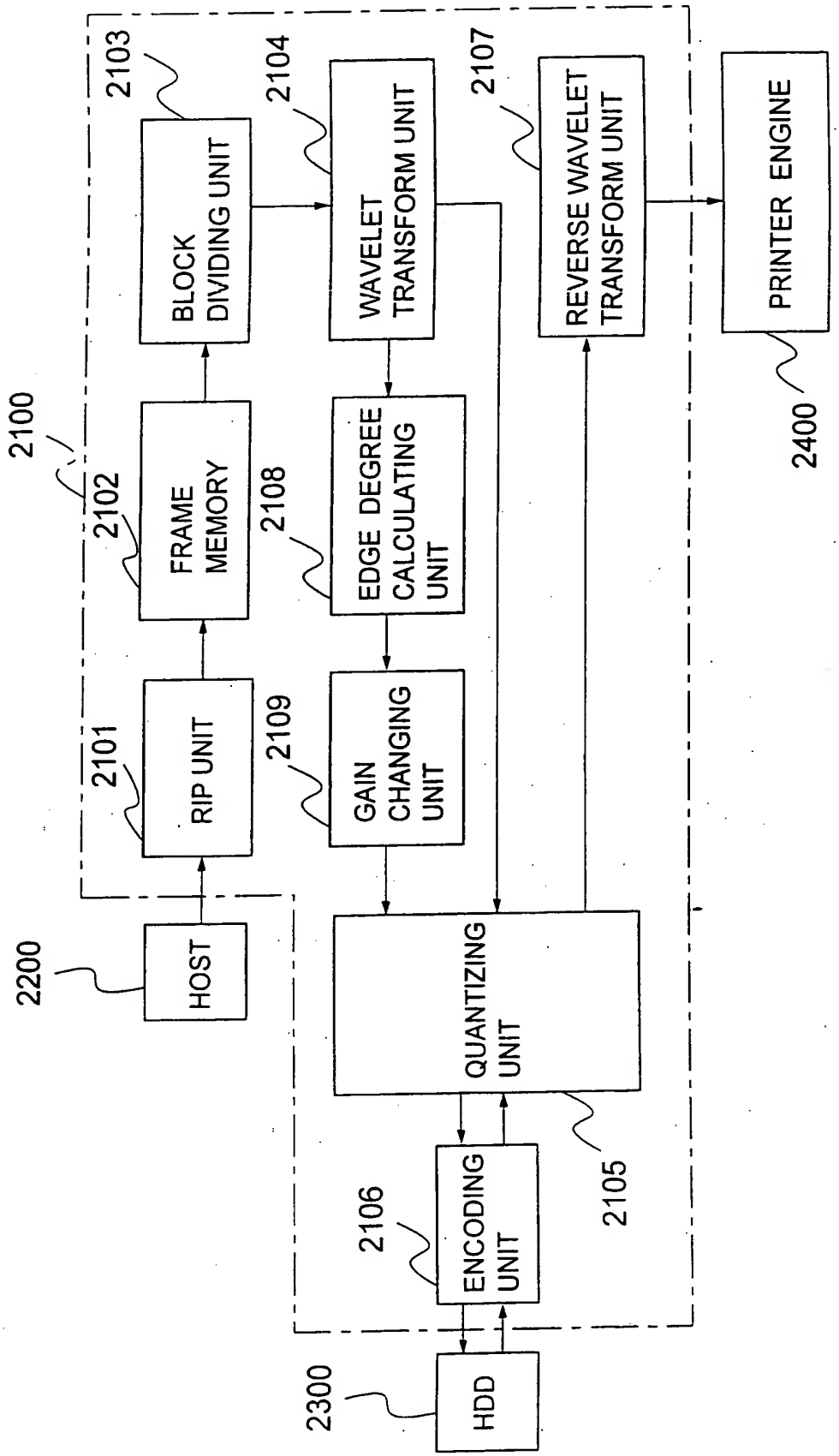

2100
2101
RIP UNIT
2102
FRAME MEMORY
2103
BLOCK DIVIDING UNIT
2104
WAVELET TRANSFORM UNIT
2105
QUANTIZING UNIT
2106
ENCODING UNIT
2107
REVERSE WAVELET TRANSFORM UNIT
2108
EDGE DEGREE CALCULATING UNIT
2109
GAIN CHANGING UNIT
2200
HOST
2300
HDD
2400
PRINTER ENGINE

FIG.26

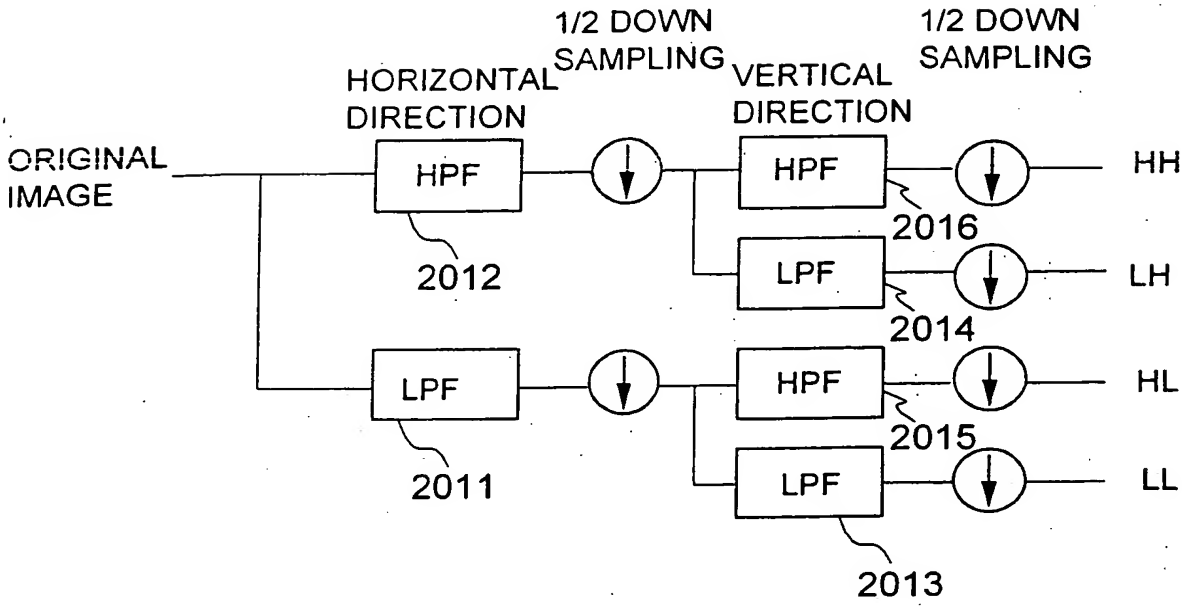

ORIGINAL IMAGE
HORIZONTAL DIRECTION
1/2 DOWN SAMPLING
VERTICAL DIRECTION
1/2 DOWN SAMPLING
HPF
LPF
HPF
LPF
HPF
LPF
HH
LH
HL
LL
2012
2011
2016
2014
2015
2013

FIG.27

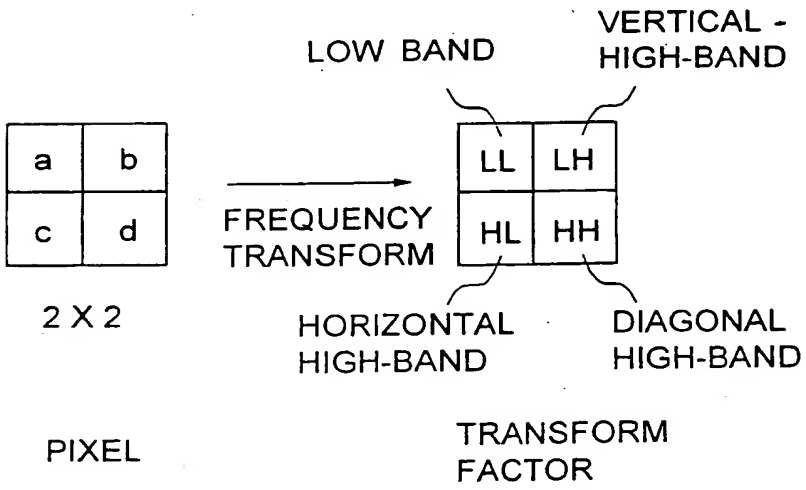

a
b
c
d
2 X 2
PIXEL
FREQUENCY TRANSFORM
LOW BAND
VERTICAL - HIGH-BAND
LL
LH
HL
HH
HORIZONTAL HIGH-BAND
DIAGONAL HIGH-BAND
TRANSFORM FACTOR

FIG.28

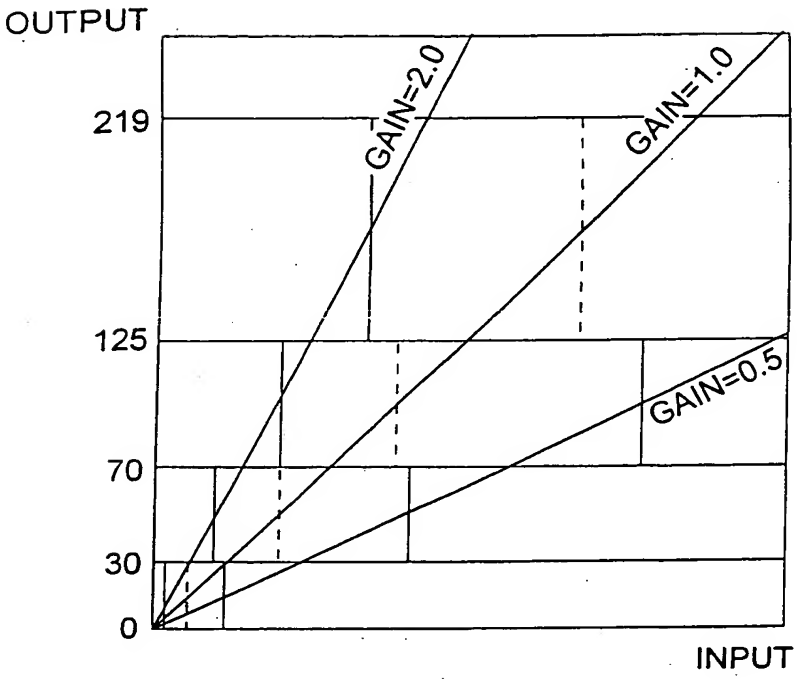


FIG.29A

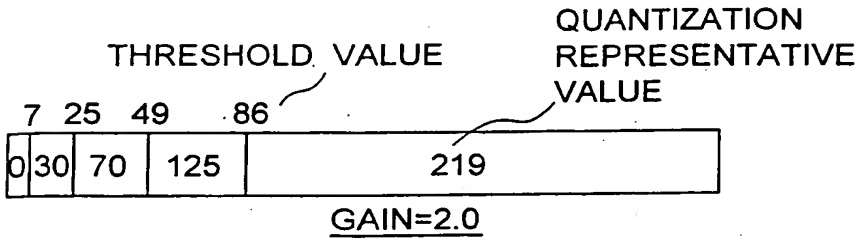


FIG.29B

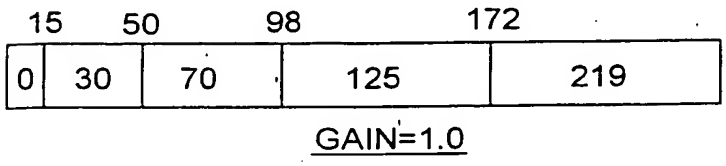
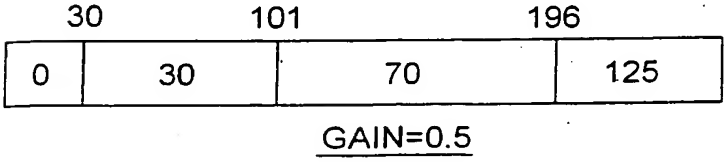
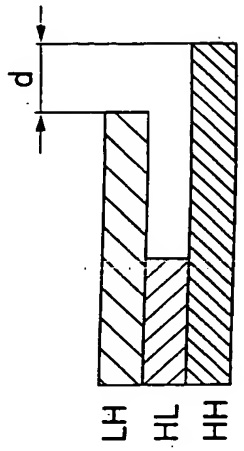


FIG.29C



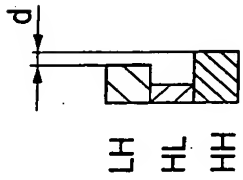
$$\text{THRESHOLD VALUE} = \frac{\text{THRESHOLD VALUE AT GAIN=1}}{\text{GAIN}}$$

FIG.30C



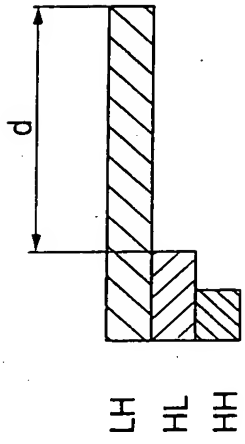
NATURAL EDGE AREA

FIG.30B



NON-EDGE AREA

FIG.30A



EDGE AREA

FIG.31

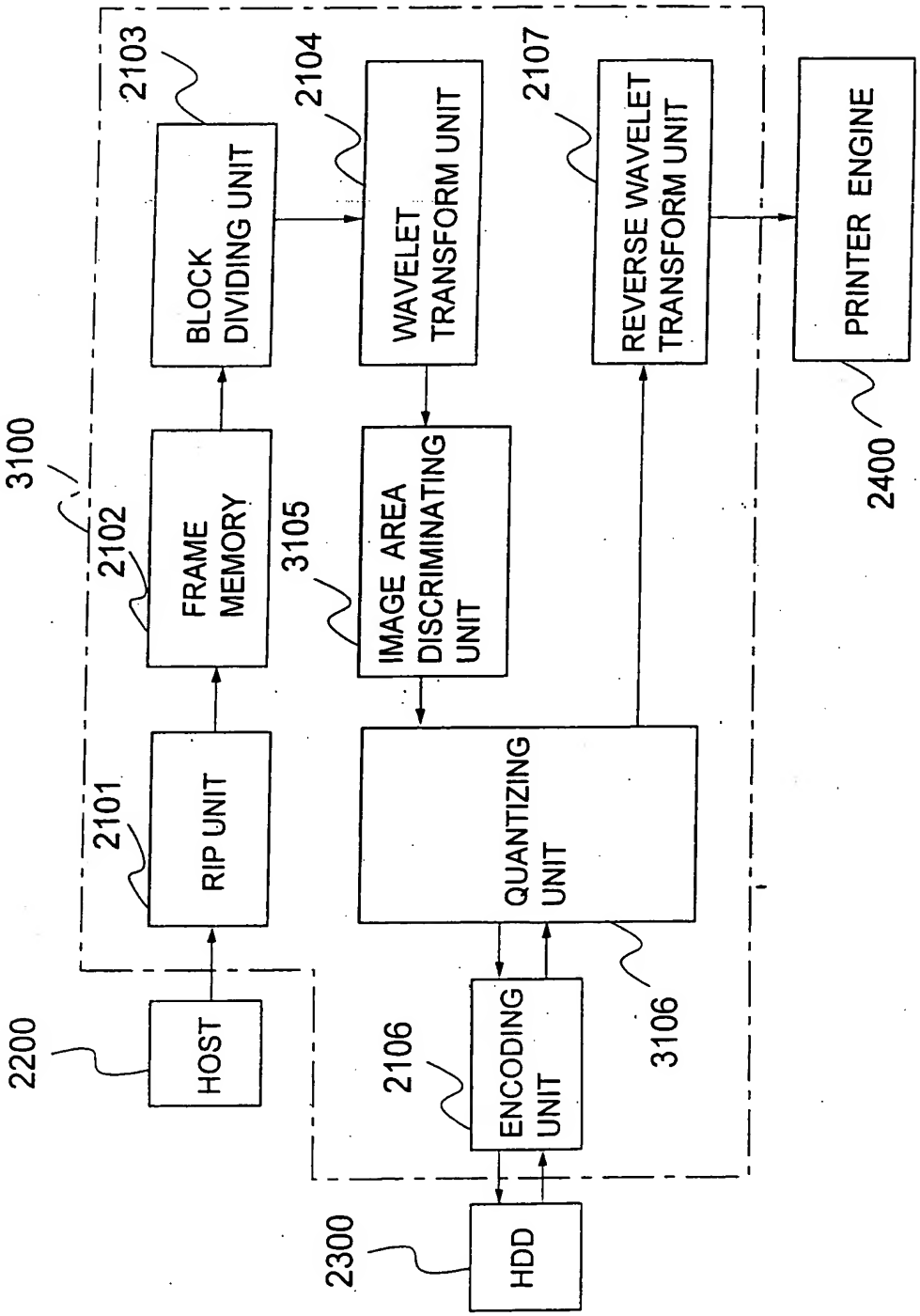
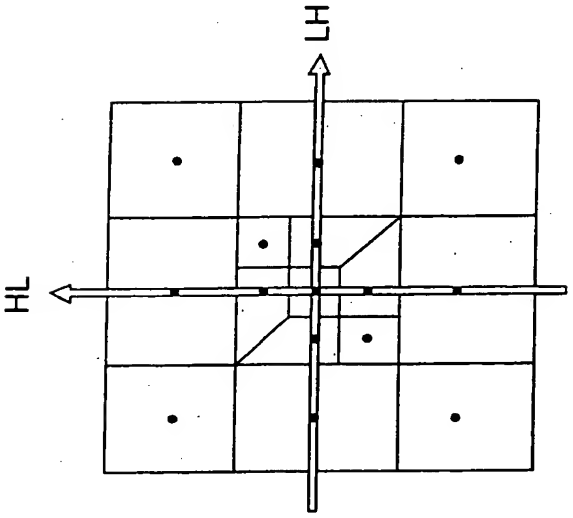
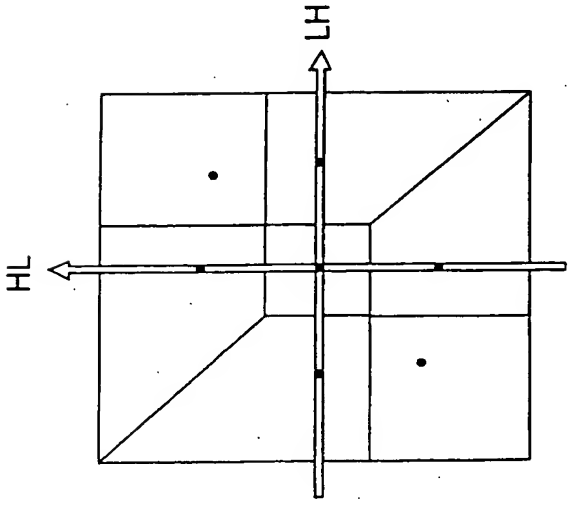

3100
2103
BLOCK DIVIDING UNIT
2104
WAVELET TRANSFORM UNIT
2107
REVERSE WAVELET TRANSFORM UNIT
PRINTER ENGINE
2400
2102
FRAME MEMORY
3105
IMAGE AREA DISCRIMINATING UNIT
2101
RIP UNIT
QUANTIZING UNIT
3106
2200
HOST
2106
ENCODING UNIT
2300
HDD

FIG.32B



15-VALUE VECTOR QUANTIZATION

FIG.32A



7-VALUE VECTOR QUANTIZATION

FIG.33

LOW-FREQUENCY FACTOR	L L L	3 BITS	H H H	HIGH-FREQUENCY FACTOR	LEVEL 2 IMAGE
HIGH-FREQUENCY FACTOR	H H H H	4 BITS	L L L L	LOW-FREQUENCY FACTOR	LEVEL 3 IMAGE
AREA INFORMATION	1	1 BIT	0	AREA INFORMATION	
	EDGE AREA BLOCK		IMAGE AREA BLOCK		

FIG.34